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ABSTRACT

A process of equalization of salaries has taken place in the State of North Dakota for higher education during the 1977-78 school year. The State of North Dakota supports eight institutions of higher education: two universities, four state colleges, and two two-year institutions. The equalization process as it effected the decision making at the University of North Dakota is documented. Tables are presented that report the results for the 1977-78 contracted salary and the 1977-78 salary after the equity adjustments. (SPG)

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EFFECTS OF STATE-WIDE SALARY EQUITY PROVISIONS ON INSTITUTIONAL SALARY POLICIES: A REGRESSION ANALYSIS

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A process of equalization of salaries has taken place in the State of North Dakota for higher education during the 1977-78 school year. An objective observer might easily come to a conclusion that politics played a major role in the decision making process. It is the intent of this paper to document the equalization process as it effected the decision making at a single institution in that the equalization initially was implemented on a statewide scale.

BACKGROUND

The State of North Dakota supports eight institutions of higher education: two universities, four state colleges and two two-year institutions. There has been a long history of disagreement over the average faculty salary figure used in the state formula to allocate salary monies to the three kinds of institutions. The State Board of Higher Education has, in the past, supported the philosophy of retaining a differential, e.g., $2000 difference between the two-year institutions and the universities and $1500 difference between the state colleges and the universities. A 6% salary increase plus implementing a differential would give larger percentage faculty salary appropriations to the state colleges and the two-year institutions.

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For the 1977-79 biennium it was the Governor's desire to stop the controversy of the differential and implement "equal pay for equal work". The amount for the biennium that would normally establish the differential was $228,776. An appropriation of $228,776 was made to be used by the State Board of Higher Education for the purpose of creating more equitable salary authorizations to the institutions and addressing primarily the aforementioned objectives.

COMMITTEE PROCEDURE

A statewide faculty equity committee met a total of four times. At the first meeting the State Budget Director and the State Board Budget Director were present to clarify the task of allocating "equal pay for equal work". At this meeting it was decided that the approach of a regression analysis be explored, and the technical advisor was asked to develop a model. This model was reviewed at the second meeting of the committee. It was decided to make a preliminary run with 1976-77 salary data for review and discussion at the third meeting. Some minor modifications were made to redefine the sample and the committee agreed to adopt the regression analysis method for the 1977-78 data at the third meeting. The Committee's last meeting was to finalize the report for the President's Council and State Board of Higher Education. While full agreement was reached on the adoption of the statistical approach, there was dissension on how to distribute the monies as resulted from the regression analysis.

STATEWIDE MODEL

All full time faculty (N=984) at state institutions of higher

education were included. Variables included six categorical variables reflecting years experience at the current institution, four variables reflecting highest degree, four rank variables, highest program level of department (graduate, undergraduate, associate) and 21 Higher Education General Information Survey (HEGIS) Classifications. Note that no traditional outcome variables (research, teaching or service) are included. One might characterize the process as an elaborate salary scale scheme.

RESULTS OF THE COMMITTEE'S ANALYSIS

Initially, inequity was defined to be a negative residual. Thus, if a person's salary exceeded the predicted salary, resulting in a positive residual, no inequity was seen to be present. For each institution the sum of negative residuals was found (but using an overall statewide equation). The total sum of negative residuals, $670,339, obviously exceeded the allocated amount. Each institution was then accorded its "share" of the total amount in relationship to its proportion of the total sum of negative residuals. Then, 25% of the amount to be allocated to the two universities was reallocated to the remaining six institutions; the reasons for the 25% devaluation of university "inequities" reflect more the compromises of the committee than any statistical consideration. Complete details of the preliminary analysis are given in Williams and Martin (1977).

In the final analysis, the University of North Dakota was to receive $51,624 for the biennium for "equity" pay. State Board guidelines included:

1. You will commit 48.5% of your allocation the first year of the biennium.
2. Distribution will only be made to those with negative residuals.
3. No individual will receive more than his or her negative residual.
4. Faculty representation is necessary in the distribution process.

Additional provisions that the University of North Dakota attempted to use included the following:

5. First, all equity monies would be distributed to colleges within the university in proportionto their present salary expenditures without regard to the residuals in the statewide equation.
6. Most available monies were to be given to professors and associate professors. Only if insufficient faculty at higher ranks were available with negative residuals would assistant professors be considered for equity adjustments.
7. In any case, only those who are seen as being especially meritorious should be given equity adjustments.

The guidelines contain sufficient incongruities to insure that they were not always applicable. The vagaries of the regression process insured some interesting adjustments: because those at higher ranks will tend to have higher salaries and hence are less probable to have negative residuals, the most likely recipients are those few higher ranked individuals who have a comparatively lower salary. In at least some cases, the lower comparative salary would

seem to be reflective of lower productivity than their same ranked colleagues. The question then arises; what effect on the overall decision making, particularly as it reflects outcome variables (research, teaching and service) do the equity adjustments cause?

RESEARCH DESIGN

All full time tenured or tenure-track faculty wholly funded on 1977-78 appropriated monies on whom complete data was available were included in the sample. The independent variables were recorded as follows:

	Variable Number		
Degree Level	2	Doctorate	(1 if, 0 if not)
	3	Bachelor's	(1 if, 0 if not)
	4	Professional	(1 if, 0 if not)
Years Experience at Current Institution	5	3-7 years	(1 if, 0 if not)
	6	8-12 years	(1 if, 0 if not)
	7	13-17 years	(1 if, 0 if not)
	8	18-22 years	(1 if, 0 if not)
	9	Over 22 years	(1 if, 0 if not)
Level of Program and Contingent Research Involvement	10	Graduate Program	(1 if, 0 if not)
	11	Sex	(1 if Male, 0 if Female)
Discipline (Hegis Taxonomy)	13	Biological Sciences	(1 if, 0 if not)
	14	Business and Management	(1 if, 0 if not)
	15	Communications	(1 if, 0 if not)
	16	Computer and Information Sciences	(1 if, 0 if not)
	17	Education	(1 if, 0 if not)
	18	Engineering	(1 if, 0 if not)
	19	Fine and Applied Arts	(1 if, 0 if not)
	20	Foreign Languages	(1 if, 0 if not)
	21	Health Professions	(1 if, 0 if not)
	22	Home Economics	(1 if, 0 if not)
	23	Law	(1 if, 0 if not)
	24	Letters	(1 if, 0 if not)
	25	Mathematics	(1 if, 0 if not)
	26	Physical Sciences	(1 if, 0 if not)
	27	Psychology	(1 if, 0 if not)

	Variable Number		
	28	Professor	(1 if, 0 if not)
Rank	29	Associate Professor	(1 if, 0 if not)
	30	Assistant Professor	(1 if, 0 if not)
Research	31	Publications	(1 if, 0 if not)
Teaching	32	Teaching Rating	(1 if, 0 if not)
	33	University Senate	
Service	34	Elected Committees	
(University Committees)	35	Senate Committee	
	36	Presidential Committees	
	37	Appointed Committees	

The dependent variables were the 1977-78 contracted salary and the 1977-78 salary after the equity adjustment. The zero coded variables were: Instructor, Sociology, 0-2 years experience and Undergraduate Degree offered in home department and a holder of a master's degree. The research variable was a measure used at the University of North Dakota; while there are many idiosyncracies involved, 10 points on the research variable would represent publication as a single author of an article published in a refereed journal of national or international status. Other types of publication are covered as well. The teaching variable is the mean rating of the faculty member by students in the most recent administration of the rating scale. Seven faculty did not have a rating, reducing the population from 319 to 312. The service variable was assessed as being number of years serving on five different kinds of university committees: memberbship on the university senate, committees elected on a university wide basis, committees elected by the university senate, committees appointed by the president and other appointed committees; ad hoc committees were not included. Committee memberships for the past five years were included.

RESULTS

Tables 1 and 2 report the results of using the previously described independent variables; these tables respectively report the results for the 1977-78 contracted salary and the 1977-78 salary after the equity adjustments.

Table 1
Multiple Regression for Equity Study
Prior to Adjustments
(N = 312)

VARIABLE NO.	MEAN	STANDARD DEVIATION,	CORRELATION X VS Y	REGRESSION COEFFICIENT	COMPUTED t Value	BETA
2	0.657	0.475	0.360	1050.36	4.299	0.145
3	0.012	0.112	-0.147	545.67	0.604	0.017
4	0.006	0.079	0.068	3203.01	2.577	0.074
5	0.240	0.428	-0.028	121.17	0.387	0.015
6	0.275	0.447	0.069	151.87	0.447	0.019
7	0.134	0.341	0.085	359.17	0.891	0.035
8	0.051	0.220	0.127	915.37	1.736	0.058
9	0.080	0.271	0.173	695.57	1.428	0.054
10	0.868	0.338	0.076	-88.02	-0.277	-0.008
11	0.855	0.351	0.267	390.88	1.307	0.039
13	0.044	0.207	0.116	-154.80	-0.300	-0.009
14	0.105	0.308	0.061	1794.89	4.724	0.160
15	0.009	0.097	-0.047	-1162.32	-1.087	-0.033
16	0.006	0.079	-0.003	2438.64	2.108	0.056
17	0.214	0.411	-0.039	746.16	2.159	0.089
18	0.051	0.220	0.153	316.68	0.637	0.020
19	0.089	0.286	-0.272	-973.55	-2.107	-0.080
20	0.044	0.207	-0.097	-1128.19	-2.154	-0.067
21	0.019	0.137	-0.067	-454.83	-0.603	-0.018
22	0.019	0.137	-0.045	620.30	0.809	0.024
23	0.022	0.148	0.175	7271.58	10.831	0.313
24	0.080	0.271	-0.034	-302.03	-0.717	-0.023
25	0.041	0.200	-0.001	-303.86	0.578	-0.017
26	0.089	0.286	0.150	99.00	0.236	0.008
27	0.041	0.200	0.000	718.88	1.350	0.041
28	0.333	0.472	0.720	8993.55	11.466	1.223
29	0.403	0.491	-0.148	5100.53	6.947	0.728
30	0.237	0.426	-0.521	2682.56	3.932	0.331
31	6.323	13.240	0.113	8.98	1.218	0.034
32	3.077	0.533	-0.126	187.99	1.004	0.029
33	0.503	1.054	0.370	324.20	3.260	0.099
34	0.189	0.670	0.241	-38.82	-0.263	-0.007
35	1.198	1.751	0.216	6.39	0.109	0.003
36	0.637	1.307	0.142	-78.59	-1.037	-0.029
37	0.044	0.346	-0.047	-274.10	-0.995	-0.027
DEPENDENT 1	13536.714	3443.010				
INTERCEPT		10514.50				
MULTIPLE CORRELATION		0.90640				
STD. ERROR OF ESTIMATE		1543.841				
MULTIPLE CORRELATION SQUARED			0.82157			
ONE MINUS MULTIPLE CORRELATION SQD			0.17843	F = 36.308		

Table 2
Multiple Regression for Equity Study
After Adjustments
(N = 312)

VARIABLE NO.	MEAN	STANDARD DEVIATION.	CORRELATION X VS Y	REGRESSION COEFFICIENT	COMPUTED t Value	BETA
2	0.657	0.475	0.365	1079.99	4.589	0.149
3	0.012	0.112	-0.148	557.57	0.641	0.018
4	0.006	0.079	0.067	3196.81	2.670	0.074
5	0.240	0.428	-0.026	158.40	0.526	0.019
6	0.275	0.447	0.074	221.49	0.676	0.028
7	0.134	0.341	0.090	442.96	1.141	0.044
8	0.051	0.220	0.125	906.15	1.784	0.058
9	0.080	0.271	0.169	668.25	1.424	0.052
10	0.868	0.338	0.078	-91.01	-0.297	-0.008
11	0.855	0.351	0.268	361.03	1.253	0.037
13	0.044	0.207	0.118	-100.49	-0.202	-0.006
14	0.105	0.308	0.061	1808.37	4.941	0.162
15	0.009	0.097	-0.049	-1139.43	-1.106	-0.032
16	0.006	0.079	-0.005	2361.01	2.118	0.054
17	0.214	0.411	-0.042	724.52	2.176	0.086
18	0.051	0.220	0.156	401.19	0.838	0.025
19	0.089	0.286	-0.273	-964.05	-2.165	-0.080
20	0.044	0.207	-0.098	-1162.17	-2.303	-0.070
21	0.019	0.137	-0.063	-337.29	-0.464	-0.013
22	0.019	0.137	-0.048	543.25	0.735	0.021
23	0.022	0.148	0.176	7342.87	11.354	0.317
24	0.080	0.271	-0.036	-317.21	-0.782	-0.025
25	0.041	0.200	0.001	-235.44	-0.465	-0.013
26	0.089	0.286	0.154	141.75	0.351	0.011
27	0.041	0.200	-0.004	691.00	1.347	0.040
28	0.333	0.472	0.723	9050.52	11.979	1.245
29	0.403	0.491	-0.142	5174.23	7.316	0.740
30	0.237	0.426	-0.530	2698.64	4.106	0.335
31	6.323	13.240	0.111	7.89	1.110	0.030
32	3.077	0.533	-0.124	219.33	1.216	0.034
33	0.503	1.054	0.367	298.29	3.114	0.091
34	0.189	0.670	0.240	-41.61	-0.292	-0.008
35	1.198	1.751	0.217	2.12	0.037	0.001
36	0.637	1.307	0.149	-61.61	-0.844	-0.023
37	0.044	0.346	-0.049	-286.46	-1.079	-0.028
DEPENDENT 12	18612.140	3431.767				
INTERCEPT		10418.76				
MULTIPLE CORRELATION		0.91287				
STD. ERROR ESTIMATE		1487.210				
MULTIPLE CORRELATION SQUARED			0.83333			
ONE MINUS CORRELATION SQD			0.16667	F = 39.427		

Table 1 reports decision making that took place at the University of North Dakota prior to any involvement (or knowledge) or the equity process; Table 1 could be seen as reflecting the priorities (even as they are changing) in the decision making process prior to the intervention. The question that arises regarding Table 1 is, "Has the intervention (equity) process changed to any significant degree the decision making process?"

A direct answer to the quesiton can be made by imposing the regression coefficients established in Table 1, plus the mean increase $73.19 to the data set that formed Table 2, using the following (Bottenberg and Ward, 1963) equation:

$$F = \frac{(q_2 - q_1)/(df_1)}{(q_1)/(df_2)}, \text{ where}$$

q_1 is the sum of squared deviations from the regression line for Table 2, and q_2 is the sum of squared deviations for the imposed equation; the F value is within rounding error of zero, showing a close fit.

While considerable difficulty is encountered in trying to interpret each coefficient in the tables, the following directions of change can be noted from Table 1 to Table 2: the research and teaching variables (Variables 28 and 31) seem to be not being attended to in the decision making process (looking at the correlation coefficient, the regression coefficient and the beta weight). On the other hand, being on the University Senate made a significant contribution. A variable included in the analyses that logically does not belong is the sex variable. It is included as a control variable; because discrimination is being attended to on a national level, the variable may have some predictive value due to efforts to eliminate discrimination. The drop in the size of the coefficient for

sex from Table 1 to Table 2 seems to be indicative of a slight attempt to address this issue. It appears that most attention is focused upon rank, degree level, and on some of the HEGIS categories, notably law (Variable 13). Using the degree variables, rank variables and six HEGIS categories (14, Management; 16, Computer and Information Sciences; 17, Education; 19, Fine and Applied Arts; 20, Foreign Languages and 23, Law) a total of twelve variables, results in only a minimal drop in the R^2, from .83333 to .81421, using the salary after the equity adjustment as criterion. Using rank and the HEGIS category for Law (a total of four variables), R^2 = .74206, amounting to slightly more than a nine per cent drop in accounted variance despite the dropping of 31 variables.

It could be argued that the reason the outcome variables have so little impact in complex equations such as are demonstrated in Tables 1 and 2 is that rank is in fact due to the outcome variables and, therefore, reduces their apparent impact. Accordingly, the outcome variables reported in Tables 1 and 2, and the equity salary variables were analyzed by rank in a one-way analysis of variance (See Table 3).

TABLE 3

Academic Rank and Outcome Variables and Salary Variables

(N = 312)

VARIABLE	Professor N=104	Associate Professor N=126	Assistant Professor N=74	Instructor N=8	F
Research	8.99	6.44	3.06	.13	3.58
Teaching	2.99	3.09	3.15	3.34	2.01
University Senate	.87	.48	.09	0	9.08
Elected Committees	.48	.06	.01	0	10.88
Senate Committees	1.56	1.43	.42	.13	8.67
Presidential Committees	.82	.77	.22	.13	4.18
Appointed Committees	.04	.05	.03	.25	1.01
1977-78 Contracted Salary	22037	17918	15321	12521	186.43
1977-78 Salary (After Equity Adjustment)	22119	18020	15350	12521	196.90
1977-78 Salary Residual (Positive Only)	407	682	708	2465	15.62
Salary Equity Adjustment	82	102	29	.00	4.11

The professors tend to have spent considerably more time in committee activity than is true of other ranks, but one might rationally question whether service on committees justifies either promotion in rank or considerably higher salaries. While professors have a higher mean research output, this difference is offset by two considerations; publication activity clearly is non-normally distributed (the standard deviation is approximately twice the mean) and the mean output is less than a single article a year. Also, the publication activity of faculty at all ranks tended, for the typical faculty member, to be almost non-existent. Previously, Martin (1977) was unable to discern any plausible explanation for promotion, other than having served in some administrative capacity. Thus, the "policy" regarding salaries is both more complex and simpler than is shown in Tables 1 and 2. It is simpler, in that knowing a person's degree, rank and whether or not they teach in a few selected departments can give almost as good an indication toward salary as is knowing the complete set of information used in Tables 1 and 2. It is more complex in that the variables that determine rank are not sufficiently known to be of much predictive value.

What then could be said about the adjustment process, in an overall sense? Apparently, no major effects on the decision making machinery has taken place. Even when a deliberate attempt is made to implement a policy at the local level, some non-compliance occurs. Note that associate professors received higher equity increases than professors even though the intention was the opposite. Also, implicit in the State Board action was that the negative residuals be closely looked at in the decision

making process; other than a limiter of the possible adjustment, the residuals were not highly related to actual increases. Using only those who had a negative residual (N=172), r = .06 between negative residuals and equity increase. Interestingly, the correlations between equity increase and the research and teaching variables were respectively -.05 and .06. However, 24 of the 36 professors with negative residuals received equity increases from $52 to $870 with a mean of $355 for those receiving raises; 46 of the 74 eligible associate professors received equity increases from $80 to $572 with a mean of $279; 9 of the 54 eligible associate professors received equity increases from $70 to $443 with a mean of $241. All eight of the instructors had negative residuals; none had an equity increase. Looking at the data yet another way, 21 faculty had 20 or more points on the research scale (two referred articles by a single author per year); 10 of these faculty were eligible for equity increases. Three such faculty actually received equity increases ($80 to $120 with a mean of $100). Clearly, research played no important part in the equity adjustment process. Teaching success, as measured by the rating scales, fared scarcely better.

Referring back to the original guidelines, the four provisions of the State Board were closely followed (with the possible exception of faculty representation); the first two of the three provisions imposed by the University itself were adhered to. Only the last provision ("... only those who are seen as being especially meritorious should be given equity adjustments.") was seemingly violated; unfortunately, the one provision that was violated might be seen by many to be the most important.

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